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Preliminary observations on the spring diet of Canada Geese on the east coast of James Bay

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Abstract

From 22 to 25 May 1989, preliminary observations on the spring diet of Canada Geese *Branta canadensis interior* were made at a Cree subsistence hunting camp on the northeast coast of James Bay, Quebec. The stomach contents of six geese were examined. The seeds of sedges (*Carex* spp. and *Eleocharis* spp.) were found in all six, and two had consumed large quantities of overwintered berries (Mountain Cranberry *Vaccinium vitis-idaea* and Black Crowberry *Empetrum nigrum*). Examination of coastal marsh feeding sites provided evidence of grubbing by geese, possibly in search of bulbs of Arrow-grass *Triglochin palustris* and Water-parsnip *Sium suave*. Our brief study indicates some important differences in the spring diets of Canada Geese on the northeast and west coasts of James Bay, and these should be investigated more thoroughly.

Introduction

The object of this study was to improve our understanding of the food requirements of Canada Geese on the northeast coast of James Bay in order to enhance the Cree's capability to construct and manage goose ponds. Knowledge of the types of plants and habitats most important to Canada Geese will also be useful in developing effective strategies for protecting and managing wetland habitats in the area.

This report summarizes the results of the analysis of the stomach contents of geese examined and describes our observations at the feeding sites. Based on this information, as well as a review of the literature, we present a hypothetical spring diet for Canada Geese on the east coast of James Bay. We also make recommendations for further research.

We thank the Cree hunters who welcomed us to their camp, allowed us to examine their geese, and willingly shared their knowledge with us. We would also like to thank Onil Faucher (JBEC) for his encouragement and administrative support, Guy Bourassa for his help in the laboratory, and Léo-Guy de Repentigny (CWS), Richard Lalumière (G. Shooner & Assoc.), and Norman Dignard (Quebec herbarium, Quebec Department of Energy and Resources) for identifying plants.

Study area

The study was carried out on the east coast of James Bay at approximately 54°17′N latitude (Fig. 1). This sector is characterized by the presence of many islands and islets and by a coastline interrupted by many coves and points. The plant cover forms a complex mosaic of habitats: salt marshes at the ends of bays, rocky coasts and islets fringed with vegetation, expanses of shrub, heathland with or without rocky outcrops and ponds, Eelgrass *Zostera marina* beds, and, inland from the coast, coniferous forest (Lalumière et al. 1989). At the time of our study, the Eelgrass beds and the lower portions of some salt marshes were still covered with ice, and there was still snow in some parts of the forest and shrub borders.

Methods

We examined seven Canada Geese shot by subsistence hunters. The geese were weighed to the nearest 50 g using a spring scale, and the length of the culmen (bill) was measured to within 0.1 mm using a vernier caliper. The age and sex of each specimen were determined by cloacal examination, and the age was verified by plumage characteristics (Hanson 1967).

We removed the esophagus, proventriculus, and gizzard from each goose using the method described by Campredon et al. (1982), modified in order not to render the other parts of the bird unusable by the hunters and their families. In a few cases, this modification caused the esophagus to tear, but the little food contained in the esophagus was retrieved. The digestive tracts and their contents were placed in plastic bags and preserved in 10% alcohol.

In the laboratory, the digestive tracts were opened and the food items extracted and sorted; the contents of the esophagus and proventriculus were analyzed together, separately from those of the gizzard. Each food item was identified, counted, oven-dried for 24 – 48 h, then weighed on an electronic scale to the nearest 0.01 g.

We visited several coastal feeding sites to examine evidence of goose feeding and to collect plant material for reference.

Results and discussion

The age, sex, and measurements of the seven Canada Geese are shown in Table 1. The weights and culmen measurements confirm that the geese were all of the race *Branta canadensis interior*, which nests in Ungava, around James Bay, and in the Hudson Bay lowlands (Hanson 1962; Bellrose 1980). With the exception of one female less than one year old, all were adults. The four adult females had well-developed ovaries, indicating that egg laying was imminent. The ovary of the juvenile female was undeveloped, which is normal for a Canada Goose of that age.

One of the geese contained no identifiable food material. The other six contained identifiable vegetable matter in the gizzard, and one of them also had a little food in the proven-

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Figure 1
Location of the hunting camp visited in May 1989

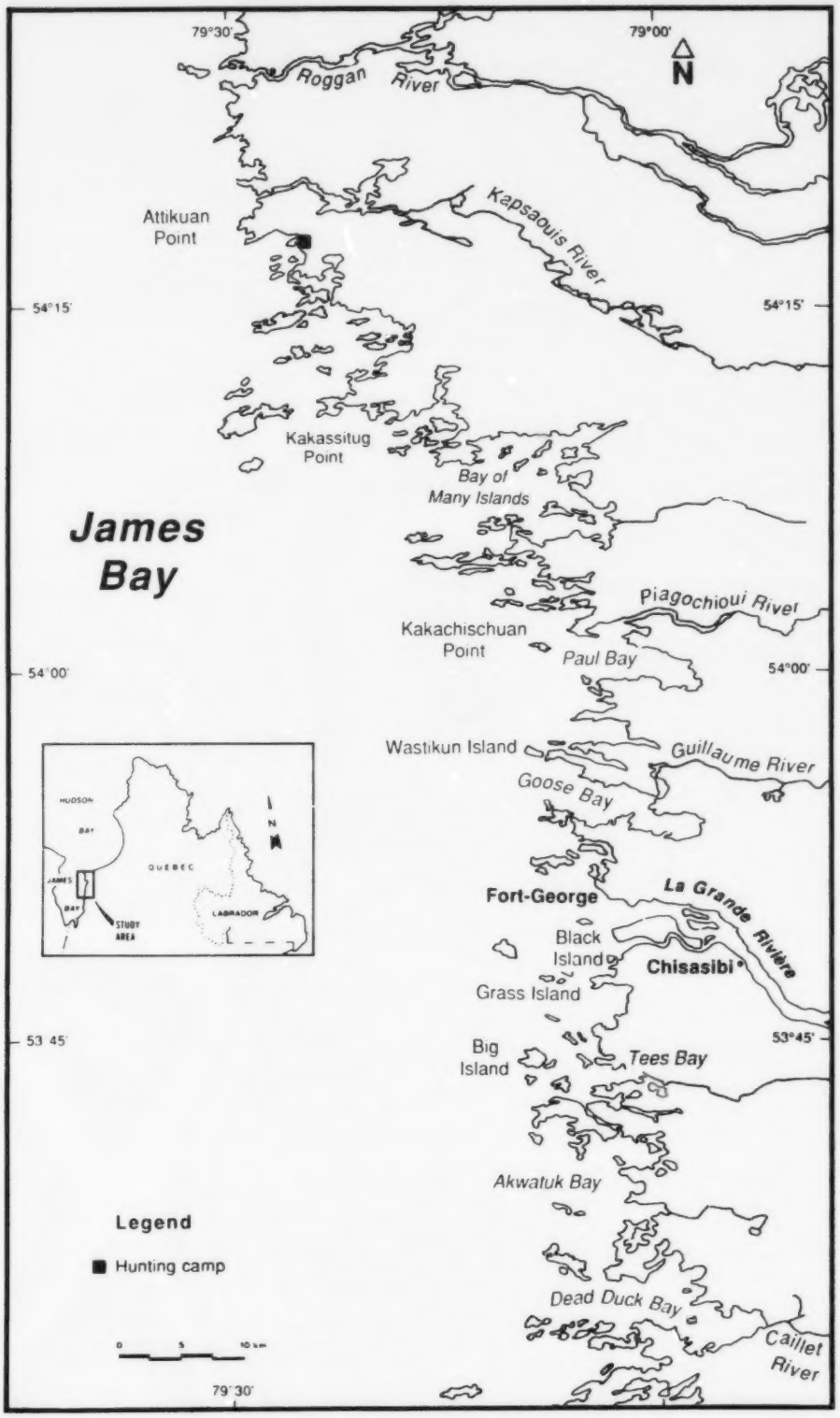

Table 1
Measurements of seven Canada Geese examined on the northeast coast of James Bay, 23 May 1989

No.	Age	Sex	Body weight (g)	Length of culmen (mm)	Diameter of largest ovum (mm)
1	Adult	F	4050	50.1	47
2	Adult	F	3850	47.9	12
3	Adult	M	4350	54.9	—
4	Adult	F	4200	47.8	29
5	Adult	M	3450	49.0	—
6	Adult	F	3500	46.1	26
7	Juvenile	F	3350	48.9	<2

Table 2
Stomach contents[1] of six Canada Geese on the northeast coast of James Bay, 23 May 1989

Item	No. of geese in which item was found	% of total geese	Dry weight (g)	% of total dry weight	Index of importance[2]
Cyperaceae					
Carex limosa seeds	2	33	0.28	3	3
C. chordorhiza seeds	2	33	0.15	2	2
C. aquatilis seeds	1	17	<0.05	tr.	tr.
Eleocharis spp. seeds	5	83	0.45	5	12
Unidentified stems	2	33	<0.05	tr.	tr.
Ericaceae					
Vaccinium vitis-idaea seeds	1	17	0.06	1	5
V. vitis-idaea fruits			0.68	8	
Empetraceae					
Empetrum nigrum seeds	2	33	6.62	76	78
E. nigrum fruits			0.45	5	

[1] With the exception of a few stems of Cyperaceae found in the esophagus and proventriculus, all the food identified was in the gizzard.
[2] The index of importance equals the percentage of total dry weight times the percentage of total geese, transposed as a percent so that the column total equals 100.

triculus and esophagus. Our analysis is therefore based on six specimens, and chiefly on the contents of the gizzards.

All the food identified was vegetable and belonged to two groups of plants: Cyperaceae (herbaceous plants of the sedge family) and low shrubs (Ericaceae and Empetraceae). The part of the sedges most frequently found was the seed, but there were also a few pieces of stem. In the case of the shrubs, only the fruit was eaten; the fruits of *Empetrum* and *Vaccinium* were found more or less intact when they had been only partially digested or were represented by seeds when the pulp had been digested. Table 2 gives details of the analysis, as well as an assessment of the relative importance of each food item. Only two of the six Canada Geese had ingested *Empetrum* berries, but they had eaten a large quantity of the berries, giving this food item a high ranking. All six geese had eaten Cyperaceae seeds, but, because of the small quantities consumed, this item is classed second in importance after *Empetrum*.

The fact that these food items came almost exclusively from the gizzards introduces a major bias into the findings. A few hours after ingestion, only those items most resistant both to the chemical process of digestion and to grinding in the gizzard remain sufficiently intact to be identified. It is therefore possible that the same geese had eaten other more tender items (herbaceous stems or leaves, bulbs, or roots) that had been digested to the point of being unidentifiable.

A study of the spring diet of 124 Canada Geese on the west coast of James Bay (Thomas and Prevett 1980; Prevett et al. 1985) also demonstrated the importance of Cyperaceae seeds, including *Eleocharis* spp. and the same three species of *Carex* found in our sample. However, the west coast study established the importance of other items that were rare in, or absent from, our sample, such as stems and roots of sedges and grasses and rootstocks of *Triglochin palustris* and Seaside Plantain *Plantago maritima*; all these items are available in our study area (this study; Lalumière 1988; Lalumière et al. 1989), and all are easily digested. We are therefore justified in adding these last items to the hypothetical list of foods eaten by Canada Geese on the east coast of James Bay.

On the west coast, Prevett et al. (1985) found no fruits of *Empetrum* or ericaceous shrubs in their numerous specimens. This reflects a real difference in diets among the geese from the two coasts and can probably be explained by the large areas of shrubby heathland on the east coast

(Lalumière et al. 1989) and their lesser importance on the west coast.

Horsetails *Equisetum* spp. were found in the diet of geese only on the west coast (Prevett et al. 1985). Again, this reflects differences in habitat; these plants can be found in fresh marshes and fens on the west coast of James Bay and the Hudson Bay lowlands (Prevett et al. 1979; Ringius 1980; Craven 1984) but seem to be rare in the coastal habitats of our study area (Lalumière, pers. commun.). Because Canada Geese seem to select *Equisetum* more than would be expected from its availability (Polunin and Eklund 1953; Craven 1984; Prevett et al. 1985), this plant may occur in their diet on the east coast of James Bay even though it is not abundant there, especially since it is of considerable nutritional value (Thomas and Prevett 1982). It has been found in the stomachs of Canada Geese in the summer, inland near Lake Caniapiscau (Rosa 1975) and near the southwest coast of Ungava Bay (Polunin and Eklund 1953).

During our visits to the feeding areas, we saw evidence of grazing of other species of plants. In a brackish marsh, we found several large bulbs of *Sium suave* that had been uprooted and partially gnawed, probably by Canada Geese. The Cree in the region know this plant as "Ouitchicans" and believe that Canada Geese eat the bulbs. In small ponds on the upper portion of salt and brackish marshes, we observed stems and rhizomes of Mare's Tails *Hippuris (H. vulgaris?)* that had apparently been uprooted by Canada Geese; we were unable to determine whether the geese had eaten any.

During the same visits to the upper part of the intertidal marshes, we saw several patches, measuring several square metres each, where the vegetative carpet had been heavily disturbed by grubbing geese in search of roots. These patches were in an area characterized by small ponds and ground cover dominated by graminaceous plants; in the upper 2–10 cm of soil, there were many bulbs of *Sium suave* and *Triglochin palustris*, as well as roots and rhizomes (more fibrous than fleshy) of unidentified sedges and grasses.

In Table 3, we have provided an annotated list of plants likely to be important in the diet of Canada Geese during their spring migration along the northeast coast of James Bay. A more exhaustive study would undoubtedly add several other important species of plants, as well as several secondary species.

We conclude that Canada Geese feed on several species of plants during their spring stopover in our study area. The seeds of sedges (*Carex, Eleocharis*) and the berries of low shrubs (*Empetrum, Vaccinium*) were shown to be important in the diet. The leaves and stems of sedges and grasses are probably important as well, but this could not be confirmed from our small sample.

Our analysis of the stomach contents of a few Canada Geese, along with some cursory field observations over a short period, suggest that there are some important differences in the spring diets of geese using the northeast coast of James Bay and those living on the west coast of James Bay and the Hudson Bay lowlands. We believe that a more thorough study of these differences is justified.

Table 3
List of plants likely to be important in the diet of Canada Geese during spring migration on the northeast coast of James Bay

Species	Part	Type of habitat	Comments
Eleocharis spp.	Seed, leaf	*E. kamtschatica*, low salt marsh; *E. smalii*, ponds and streams in high salt marsh	
Carex salina	Seed	High salt marsh; forms small monospecific prairies	The seeds of several species of *Carex* and *Eleocharis* accumulate in windrows around ponds, where they are available to geese
C. limosa	Seed	Upper part of high salt marsh	
C. aquatilis	Seed	Overlaps upper part of high marsh and fens; forms small prairies	
C. chordorhiza	Seed	Dispersed on *Empetrum* heath	Eaten during visits to heathland?
C. subspathacea	Leaf?	Lower part of high salt marsh	Two species form low carpet grazed by several species of geese
Puccinellia phryganodes	Leaf	Lower part of high salt marsh	
Festuca rubra	Leaf	Upper part of high salt marsh	
Triglochin palustris	Root	Low salt marsh and lower part of high salt marsh	Rich in starch, important for Snow Geese (less for Canada Geese) on the west coast of James Bay
Plantago maritima	Root	Low salt marsh	
Equisetum spp.	Stem	Fens and freshwater ponds, inland	Selected even when not abundant because of its nutritional value
Sium suave	Root	Freshwater marsh, transition between salt marsh and fen	"Ouitchicans," role in diet not confirmed
Vaccinium vitis-idaea	Fruit	Heathland	Fruits remain on branches all winter and are available to geese in spring
Empetrum nigrum	Fruit	Heathland	

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